KASA Redberg

Engineers & Technical Trainers

Course Information Kit 2023

Issue A

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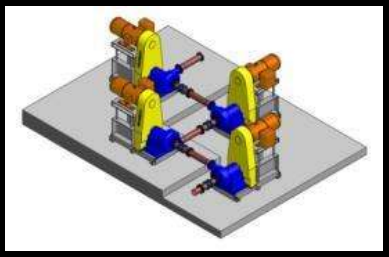
Contents



Introduction

Welcome to the "*KASA Redberg 2023 Course Information Kit*." All of the information relating to our courses and seminars is in one document to provide a more convenient way of showing the type of learning we can provide within the areas of: pumps, pipes, valves, tanks, and pressure vessels as well as ancillary topics such as safety-in-design.

We are now in the nineteenth year of running our flagship courses – "*Pump Fundamentals*" and "*Liquid Piping Systems Fundamentals*". We have also been running "*Advanced Slurry Pumping & Piping*" since May 2008. In 2010 we launched three new courses:

- *Gas Piping Systems Fundamentals*
- *Piping Design to AS4041 & ASME B31.3*
- *Pressure Vessel Design to AS1210*

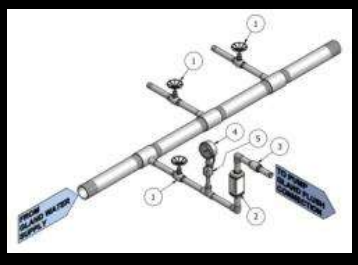
In 2014, we celebrated our ten year anniversary as a company, and to mark the occasion, we introduced our first ever "e-learning" course titled "*Safety in Design – Fundamentals for Australian Designers*" which is available via our LMS (Learning Management System). Please check-out our website for further information related to our e-learning offering which will be geared towards "learn-at-your-own-pace" courses which will compliment our customised and standard in-house seminars.

In 2021, we have rolled-out a new course titled *"Pressure Vessels & Pressure Piping – Essential Knowledge for End Users*". This course is aimed at engineers who are not designers but need to know how to keep pressure equipment safe and operable whilst understanding the codes, standards and legislation that applies. This year we will spend time developing new short courses and at the same time converting some of our existing face-to-face content for delivery via our online platform. For example, "*Flanged Joints for Piping*" will be released later in 2023. The push for more courses to be made available on-line has been primarily due to the COVID-19 pandemic which curtailed public courses as well as private (in-house) course offerings in the 2020-21 period. We are hopeful that 2023 will see us provide more private (in-house) courses with a return to public courses in June.

We hope that your organisation sees the value of booking an in-house course with us in 2023 and remember, all of our online or face-to-face courses can be customised, amalgamated and delivered directly to you at your own workplace. Please contact us for a detailed proposal and remember to check our website throughout the year for additional online (e-learning) courses.

Best regards,

The KASA Redberg Team



Face-to-Face Courses

Pump Fundamentals

Introduction

Pumps are found in all industries and come in all shapes and sizes. Decision makers operating in areas such as water treatment, minerals processing, oil and gas, utilities, metals processing, food and beverage and many more employ billions of dollars worth of pumping equipment to help achieve their objectives.

To ensure that you are achieving maximum performance from your pumping equipment, it is essential that you know the fundamentals. "*Pump Fundamentals*" is an intensive, practical and interactive two day seminar which focuses on the common types of pumps and how to select, install, troubleshoot and maintain them.

Who Should Attend

Process, Design, Project and Consulting Engineers; Line Managers and Supervisors; Maintenance Technicians; Pump Sales Representatives; or anyone who needs to select, specify, commission, install and/or maintain pumping equipment.

Delegate Pre-Requisites

It is a requirement that each delegate has an understanding of mechanical components. A basic understanding (trade level or higher) engineering maths would also be a necessity. Ideally, each delegate should have a degree or diploma in a relevant technical field or a higher level mechanical trade qualification.

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

- Identify common pump types and their components
- Understand pump, associated component, hydraulics and slurry terminology
- Select the most appropriate pump type, make and model for an application
- Be competent in reading and using pump performance curves
- Understand cavitation and how to prevent it from occurring
- Specify the correct installation configuration for a particular pump type
- Install, commission, operate and maintain common pump types
- Troubleshoot pump problems

Training Seminar Materials

All delegates receive:

- The **"Pump Fundamentals" Training Manual** – a reference manual comprising theory, worked example problems, tables , charts and illustrations etc based on the seminar outline. This manual has been designed to be a valuable future resource for the office, workshop, factory or plant.

- **Certificate of Attendance** – which states the number of hours of training and serves as documentary proof of attendance.

Complementary Training

"*Pump Fundamentals*" is the first in a series of three pump and piping training seminars pitched at a "fundamentals level". It provides a practical introduction to the world of pumps and their applications.

The two companion seminars to "*Pump Fundamentals*" deal with liquid and gas piping systems.

Plant Engineers, Project Managers and Process Engineers should consider undertaking all three of KASA's "fundamentals level" training seminars to help aid their knowledge of pumping and piping systems.

It is also recommended that "*Pump Fundamentals*" is attended prior to attending KASA's "*Advanced Slurry Pumping & Piping*" training seminar.

Pump Fundamentals

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
•Terms and Definitions
•Fluid Properties (Viscosity, Density, Temperature etc)
•Pressure-Head Relationships
•Cavitation
•Basic Hydraulics Theory and Calculations
•Friction Losses in Pipes and Fittings
•Pump Classifications and Examples
•Pump Selection Guidelines
•Worked Example Problems

CENTRIFUGAL PUMPS
•Components, Types and Examples
•Affinity Laws and Characteristic Curves
•Matching the System to the Pump
•System Curve Calculations
•Viscosity Effects
•Parallel and Series Pumping Circuits
•Cavitation – Causes, Remedies and Calculations
•Troubleshooting
•Worked Example Problems

INTRODUCTION TO CENTRIFUGAL SLURRY PUMPS
•Slurry Classifications and Rheology
•Slurry Characteristics – Abrasion, Erosion and Corrosion
•Effects of Slurry Solids Content and Settling Velocities
•Typical Pump Components and Assemblies
•Characteristic Curves
•Pump Selection Criteria
•Worked Example Problems

DAY 2

POSITIVE DISPLACEMENT (PD) PUMPS
•PD Pump Theory
•Typical System Curves
•Comparison to Centrifugal Pumps
•A Detailed Analysis of Common PD Pumps –
•(Gear, Lobe, Progressive Cavity, Piston,
•Diaphragm, Peristaltic)
•Troubleshooting
•Worked Example Problems

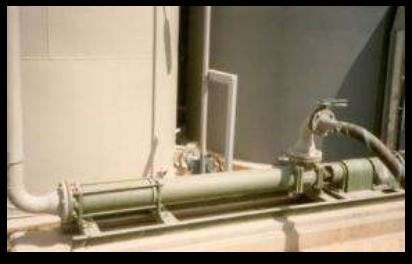
EDUCTORS (JET PUMPS)
•Principle of Operation
•Applications

SEALS AND PACKING
•General Overview
•Components and Types
•Applications and Selection
•Installation, Maintenance and Troubleshooting

PUMP DRIVES
•General Overview
•Close Coupled, Direct Driven, Canned and Magnetic Setups
•Belt Drives, Gearboxes, Variators
•Electric Motors and Inverters
•Engines and Hydraulic Motors

INSTALLATION & MAINTENANCE

FOUNDATIONS AND BASES
•Alignment
•Process Connections
•Recommended Piping Configurations
•Condition Monitoring and Preventative Maintenance



Liquid Piping Systems Fundamentals

Introduction

As a rule of thumb, “Piping” accounts for (i) 30 percent of the material costs of a process plant or water treatment facility (ii) 30 percent of the construction labour and (iii) 40 percent of the total engineering time expended in designing, installing or commissioning a plant. Despite piping systems accounting for such a large “chunk” of an overall plant, it is amazing how so many errors are made with regard to the design of such systems. For example, the incorrect selection of piping materials, end connections, valves, fittings and support systems are all too common in industry.

The purpose of this two day seminar is to provide basic instruction on the design, operation and maintenance of liquid piping systems.

Who Should Attend?

Process, Design, Project and Consulting Engineers; Line Managers and Supervisors; Maintenance Technicians; Pump Sales Representatives; or anyone who needs to select, specify, commission, install and/or maintain liquid piping systems and pipelines.

Delegate Pre-Requisites

It is a requirement that each delegate has an understanding of mechanical components. Experience with diploma or degree level engineering maths would also be advantageous.

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

• Select the most appropriate material and pipe type for the application.
• Determine the correct pipe schedule for an application.
• Understand cavitation and water hammer.
• Select the most appropriate valve type for an application.
• Understand control valve sizing.

Seminar Objectives Continued

• Read and generate drawings such as P&ID’s and isometrics.
• Be aware of the issues involved in designing pipe and pipe support systems.
• Be aware of various fabrication, installation and maintenance Issues.

Training Seminar Materials

All delegates receive:

• The **“Liquid Piping Systems Fundamentals” Training Manual** – a reference manual comprising theory, worked example problems, tables, charts and illustrations etc based on the seminar outline. This manual has been designed to be a valuable future resource for the office, workshop, factory or plant.

• **Certificate of Attendance** – which states the number of hours of training and serves as documentary proof of attendance.

Complementary Training

“*Liquid Piping Systems Fundamentals*” is the second seminar in a series of three “fundamentals level” pump and piping training seminars. It provides a practical introduction to liquid piping systems. It is not necessary to have previously attended any other KASA Redberg seminar prior to attending this one for the maximum benefit to be obtained.

It is recommended that this seminar is attended prior to attending “*Gas Piping Systems Fundamentals*” as all KASA Redberg seminars have now been re-designed so that only a bare minimum of information is duplicated across all seminars.

Liquid Piping Systems Fundamentals

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
- Terms and Definitions
- Pipe Manufacturing Methods
- Fluid Properties
- Basic Hydraulics Theory and Calculations
- Friction Losses & Pipe Sizing
- Cavitation and Water Hammer
- Worked Example Problems

SELECTING PIPE & FITTINGS
- Applicable Codes and Standards
- Materials of Construction, Connection
- Types – Screwed, Flanged, Sanitary etc
- Gaskets and Jointing Materials
- Fittings
- Worked Example Problems

VALVES
- A detailed Analysis of Common Valve Types –
- (Ball, Butterfly, Globe, Gate, Pinch, Angle, Needle, Check,
- Pressure Reducing, Solenoid, Vacuum/Pressure Break,
- Pressure Relief, Diaphragm etc)
- Materials of Construction
- Valve Actuators
- Valve Selection & Sizing Guidelines
- Control Valve Selection and Sizing
- Valve Maintenance and Troubleshooting
- Worked Example Problems

INSTRUMENTS
- Typical Instruments Found in Piping Systems
- Selection Guidelines

DAY 2

DESIGN & DRAFTING
- Piping Specifications
- Drafting Symbols for Pipes, Valves, Fittings, Instruments etc
- Process Flow Diagrams, Piping & Instrumentation Diagrams
- Line Lists, Plot Plans, Layouts, Isometrics, Spool Drawings

GUIDELINES FOR THE LAYOUT OF PIPING
- General Overview
- Maintenance and Operating Requirements
- Process Requirements
- Safety Considerations

PIPE SUPPORT SYSTEMS
- General Overview
- Rigid, Variable and Spring Supports
- Snubbers, Sway-Braces, Base-plates
- Introduction to the Design of Pipe Supports

AN INTRODUCTION TO PIPING DESIGN LOADS
- Sustained Loads – Weight and Pressure
- Occasional Loads – Wind, Relief Valve and Seismic
- Thermal Loads, Stresses and Movements
- Basic Manual Calculation Methods
- Worked Example Problems

MISCELLANEOUS TOPICS
- Heat Tracing
- Insulation
- Filters & Strainers
- Fabrication & Erection
- Maintenance

Gas Piping Systems Fundamentals

Introduction

Compressible flow offers some unique challenges when compared to liquid flow in pipes. This is due to the properties of gases and how these properties change depending on the piping system temperature, pressure and even flow velocity.

The purpose of this two-day seminar is to provide information and guidance on the design of gas piping so that those new to gas piping systems can design such systems with minimal supervision.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, Sales Representatives and anyone who needs to have a greater understanding of the design and operation of gas piping systems including fuel gas, steam, compressed air and nitrogen etc.

Delegate Pre-Requisites

As this seminar includes many system design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or mining engineering or physics, chemistry etc).

For the maximum benefit to be obtained, it is recommended that each delegate:

•Is familiar with basic hydraulics theory.

•Has had some previous exposure to gas piping systems.

•Has a basic understanding of the more common valve types.

Those who have previously attended KASA's "*Liquid Piping Systems Fundamentals*" seminars should also be well placed to derive maximum benefit from this seminar.

Overlap With Other KASA Piping Seminars

This seminar has been designed so that it is attended after delegates have already completed KASA's *"Liquid Piping Systems Fundamentals*" seminar. Because of this, any information relating to piping materials, piping connections, valves, instruments, drafting and hydraulics theory that is presented in the "*Liquid Piping Systems Fundamentals*" seminar will not be presented again in this seminar. It is advised that delegates review these topics as they are considered "assumed knowledge".

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

•Understand how pressure, temperature and velocity affect compressible fluid properties.

•Appreciate the higher risks associated with compressible flow systems compared to liquid flow systems.

•Perform pipe sizing calculations for the flow of fuel gas, steam, compressed air etc based on a number of popular industry methods.

•Perform basic control valve sizing calculations and have a greater understanding of the difficulties associated with control valves for compressible flow.

•Be better placed to select materials of construction for common gas piping systems.

•Design/select/calculate gas piping ancillaries such as: relief and safety valves; flares and vents; dryers; condensate traps.

•Be aware of the more common gas piping operational issues such as "double block and bleed", valve leakage classes, determining system leakage, wear rates and hot tapping etc.

•Be able to perform pressure drop calculations for gases in pipes, fittings and valves using common industry methods.

•Have a greater understanding of hazardous area classifications and the flow of combustibles through pipe systems.

•Appreciate how to better lay gas piping systems out so that operational safety is paramount.

Training Seminar Materials

All delegates receive:

•**A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Gas Piping Systems Fundamentals

Seminar Synopsis

DAY 1

SAFETY & HAZARDS
•Leaks versus plumes.
•An introduction to hazardous area classifications.
•Isolation, double block and bleed; draining and venting considerations.
•The piping of combustibles, flammables etc.
•Examples of gas and piping systems failures.

BACKGROUND INFORMATION
•Fluid properties and hydraulics theory common to all compressible fluids: specific gravity, vapour pressure, gas laws, cavitation, the laws of thermodynamics, Joule-Thomson, terms and definitions.

COMPRESSED AIR
•The properties of air.
•Free air, standard air and actual air.
•Plant air versus instrument air.
•Compressed air pipe sizing methods and pressure drop calculations.
•Materials and end connections for compressed air systems.
•Traps, dryers, filters and other ancillaries.
•Piping layout tips specific to compressed air.
•Worked example problems.

NITROGEN
•The properties of Nitrogen.
•Comparison to compressed air including pipe sizing methods, ancillary equipment, layout etc.

STEAM
•Enthalpy, specific heat, steam tables, steam quality.
•Steam pipe sizing methods and pressure drop calculations.
•Steam flow through nozzles and restrictions.
•Materials and end connections for steam piping systems.
•Steam piping ancillaries, valves and instruments.
•Piping layout tips specific to steam.
•Worked example problems.

DAY 2

GAS – GENERAL (INCLUDING FUEL GAS)
•Flow types – Adiabatic, Isothermal and Isentropic
•Properties of gases – mass, volume, density, specific gravity, viscosity, compressibility factor, heating value.
•"Ideal" versus "Real" gases.
•Gas mixtures and how to calculate their mixture properties.
•Gas pipe sizing methods and pressure drop calculations.
•An introduction to two phase flow calculations.
•Discussion and tips relating to relevant piping standards and codes.
•Specific tips relating to fuel gas systems.
•Recommended piping materials and end connections for specific gas systems.
•Recommended piping layout tips for specific gas systems.
•Worked example problems.

VALVES
•Valves and applications specific to compressible flow (that are not presented in KASA's "Liquid Piping…" seminar).
•Leakage classes.
•Recommended valves tips for particular applications.
•Purchasing and specifying valves for flammables, combustibles and "dangerous" fluids.
•Safety and relief valve sizing (including flare and vent pipe sizing) for specific applications.
•Tips relating to valve materials of construction.
•The sizing and selection of control valves for gas, air and steam applications.
•Worked example problems.

INSTRUMENTATION
•Instrumentation specific to compressible flow (that is not presented in KASA's "Liquid Piping…" seminar).

MISCELLANEOUS TOPICS
•Hot-tapping, inspection and maintenance, leakage, wear, testing requirements, commissioning and common "traps for the inexperienced".



Advanced Slurry Pumping & Piping

Introduction

The design of slurry pumping systems is considerably more complex compared to that of "clean fluids". In addition to this, the information found in the public domain relating to this subject is sometimes "academic" and does not always give the practicing engineer the simple answers he or she needs to solve a particular problem. As a result, consultants who specialise in slurries are often employed even for the less complex slurry pumping design or troubleshooting problems.

The purpose of this two-day advanced seminar is to provide information and guidance on the design of slurry pumping and piping so that the practicing engineer can either (i) design slurry systems "in-house", and/or (ii) more successfully interact with specialist slurry consultants and/or slurry pump manufacturers.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, Slurry Pump & Piping Sales Representatives and anyone who needs to select, specify, commission, install and/or troubleshoot slurry pumping equipment and slurry piping.

Delegate Pre-Requisites

Whilst this seminar is focused on the practical aspects of slurry flow, it is classed as an advanced level seminar due to:

•The higher level of hydraulics theory presented (i.e. compared to that presented in KASA's "Fundamentals" seminars).

•The level of engineering mathematics understanding required in some calculations and first-principle proofs.

For the maximum benefit to be obtained, it is recommended that each delegate:

•Is familiar with basic hydraulics theory.

•Has had some previous exposure to slurry systems.

•Is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or mining engineering).

Those who have previously attended KASA's "*Pump Fundamentals*" and "*Liquid Piping Systems Fundamentals*" seminars should also be well placed to derive maximum benefit from this seminar.

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

•Understand how the relevant slurry properties are determined in a laboratory environment.

•Understand how flow curves are derived from viscometer test results.

•Understand the principles of scaling-up from small-scale pipe loop tests, tube viscometers or existing pipelines for the purposes of designing full-scale pipelines for the same slurry.

•Understand the principles of determining head loss in both settling and non-settling slurries using the relevant theoretical models and/or laboratory test results.

•Determine the "Deposit Velocity" (aka "Limiting Settling Velocity") by calculation for a settling slurry.

•Be aware of the effects of particle size and solids concentration with respect to de-rating of pump performance for a particular slurry.

•Appreciate the advantages and disadvantages of the more commonly used slurry piping materials so that material selection can be carried out in a more informed manner.

•Be aware of the more common piping operational issues.

•Determine whether a centrifugal slurry pump or a positive displacement pump is a better choice for a particular application.

•Have a greater understanding of the more commonly available centrifugal and positive displacement pumps used for slurries.

•Be aware of various slurry pump operational issues, recommended piping configurations and component choices (i.e. seals, packing, liners etc).

Training Seminar Materials

All delegates receive:

•**A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Advanced Slurry Pumping & Piping

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
•Specific Gravity, solids concentration, particle size analysis, rheograms (aka "flow curves"), viscosity.
•Newtonian and Non-Newtonian slurries
•Non-Newtonian Flow Models
•Homogeneous, heterogeneous, stratified and sliding bed flow profiles.
•Classifications – Settling and Non-Settling slurries.
•Slurry Pump Performance Basics.
•Worked Example Problems.

SLURRY PIPING – MATERIALS, EXAMPLES & ISSUES
•A review of common slurry piping materials of construction including: rubber lined steel, ceramic lined steel, plastic lined steel, polyethylene, fibreglass etc.
•Selection criteria, advantages/disadvantages etc of the above-mentioned materials.
•Pipe wear and wear testing methods.

PIPING DESIGN FOR NON-SETTLING SLURRIES
•Recommended methods for determining head loss for laminar and turbulent flow from viscosity measurements and/or small-scale pipe flow data.
•Recommended method for determining head loss for Newtonian Non-Settling Slurries.
•Worked example problems.

CENTRIFUGAL SLURRY PUMPS
•Components, types, examples, design features.
•Selecting materials of construction based on wear classes and service classes.
•Envelopes of operation.
•Series and parallel pumping, design & operational Issues.
•A review of the commonly available types of seals and packing.
•Focus on submersible slurry pumps
•Focus on horizontal end-suction slurry pumps.

DAY 2

CENTRIFUGAL SLURRY PUMPS (CONTINUED)
•Drive Arrangements.
•Maintenance considerations.
•Gland water setups.

THE DE-RATING OF SLURRY PUMPS
•Recommended methods of determining the de-rating effects (i.e. Head Ratio, Efficiency Ratio etc) on centrifugal slurry pumps when dealing with settling slurries.
•Dealing with non-settling, non-Newtonian slurries.
•Dealing with frothing slurries.
•NPSHR corrections.
•Worked example problems.

PIPING DESIGN FOR SETTLING SLURRIES
•Recommended methods for determining head loss.
•Recommended methods for determining the Deposit Velocity.
•Recommendations for pipe diameter and flow velocity.
•Flow in inclined pipes.
•Worked example problems.

ROTARY POSITIVE DISPLACEMENT PUMPS
•A brief review of Progressive Cavity, Lobe and Peristaltic Pumps.
•Selection criteria, relative advantages and disadvantages, envelopes of operation.
•Operation and maintenance considerations.

RECIPROCATING POSITIVE DISPLACEMENT PUMPS
•A review of piston, piston-diaphragm, piston-diaphragm-hose and diaphragm pumps for slurry pumping applications.
•Selection criteria, relative advantages and disadvantages, envelopes of operation.
•Operation and maintenance considerations.
•Recommended suction and discharge piping arrangements.
•Recommendations on when to choose a PD pump and when to choose a centrifugal pump.



Piping Design to AS4041 & ASME B31.3

Introduction

The purpose of this two-day seminar is to provide guidance on the fundamentals of piping stress and flexibility analysis so that compliance with AS4041 and/or ASME B31.3 is achieved. The secondary aim is to show how to spot check the results from computer based solutions using conservative manual calculation methods.

Upon completion of this seminar, the attendee should be well placed to perform common pressure piping stress and flexibility analysis tasks under the minimal supervision of a Senior/Supervising Engineer.

Who Should Attend

Engineers who are required to design piping systems as part of their job function or those who want to have a better understanding of the requirements of AS4041 and/or ASME B31.3. This seminar is ideally suited to Junior/Graduate Engineers or those new to the field of piping design and stress analysis.

Delegate Pre-Requisites

As this seminar includes numerous design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

For the maximum benefit to be obtained, it is recommended that each delegate:

•Is familiar with basic hydraulics theory.

•Has had some previous exposure to piping systems.

Those who have previously attended KASA's "*Liquid Piping Systems Fundamentals*" and "*Gas Piping Systems Fundamentals*" seminars should also be well placed to derive maximum benefit from this seminar.

Overlap With Other KASA Piping Seminars

Material relating to the pressure design of straight pipe (to AS4041) is briefly introduced in KASA's "*Liquid Piping Systems Fundamentals*" seminar. In this "*Piping Design to AS4041 & ASME B31.3*" seminar, this material is taken to a more advanced level. There is no overlap with any other KASA seminar.

Seminar Objectives

The following primary learning objectives have been designed so that each attendee can:

•Understand the difference between "piping hydraulic design", "piping stress analysis" and "piping flexibility analysis".

•Have an appreciation for how "strength of materials" theory forms a basis for all international piping design codes.

•Understand the intent of both AS4041 and ASME B31.3 and how the design process should proceed so as to ensure compliance with these piping codes.

•Using manual calculation methods, determine the required wall thickness for pipes exposed to load combinations such as internal or external pressure/vacuum, wind, earthquake etc in accordance with the nominated piping codes.

•Using manual calculation methods, design elbows, bends, branches, fabricated tees, headers etc in accordance with the nominated piping codes.

•Using manual calculation methods, determine pipe support spacing and design appropriate supports.

•Understand fatigue analysis, flexibility analysis, fabrication, testing and examination of piping.

•Use appropriate judgment when dealing with stresses at connections with rotating and stationary equipment.

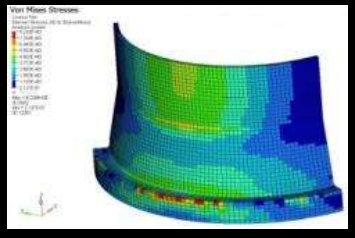
Training Seminar Materials

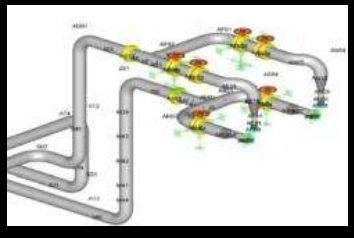
All delegates receive:

•**A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Note: KASA is no longer supplying copies of AS4041 and ASME B31.3 for use during the seminar. It is not absolutely necessary to have a copy of AS4041 and ASME B31.3 available during the seminar (but attendees may wish bring their own copies of these piping codes should they wish to bookmark particular sections for future reference).





Piping Design to AS4041 & ASME B31.3

Seminar Synopsis

DAY 1

STRENGTH OF MATERIALS
•Terms and definitions.
•Stress, strain, allowable stresses and safety factors.
•Principle and secondary stresses.
•Axisymetric loading.
•Bending and torsion of pipes.
•Pipes subjected to plane stress.
•Combined bending, torsion and pressure loading.
•Failure theories used in piping design codes.
•Stresses and deflections due to temperature.
•Cyclic loading and creep.
•Examples of piping failure.
•Worked example problems.

AS4041 & ASME B31.3 BACKGROUND
•The history and intent of AS4041 and ASME B31.3.
•The basis of AS4041 and ASME B31.3.
•How to use piping codes.
•A "walk-through" of AS4041 and ASME B31.3.
•Assessment and classification of piping/service combinations.
•Worked example problems.

AS4041 & ASME B31.3 PIPE STRESS ANALYSIS
•Design temperature, design pressure and design loading combinations for stress analysis purposes.
•Basis for determining allowable stresses.
•Reduction factors, allowable stress tables.
•Determining wall thickness for internal pressure.
•Determining wall thickness for external pressure.
•Design of stiffener rings for external pressure or vacuum conditions.
•Design of elbows, bends, branches, fabricated tees, headers etc.
•Determining pipe support spacing.
•Dealing with combined static loadings.
•Dealing with dynamic fluid loadings.
•Worked example problems.

DAY 2

AS4041 & ASME B31.3 PIPE FLEXIBILITY ANALYSIS
•Forces, stresses and displacements due to thermal expansion.
•Methods of providing piping flexibility.
•Stress Intensification and Flexibility Factors (SIFs), elastic equivalent stress, allowable thermal expansion range.
•Cold spring.
•Pressure and its effects on piping flexibility.
•Guidelines on when to perform a piping flexibility analysis.
•The balance between flexibility and structural stability.
•Worked example problems.

PIPE SUPPORTS
•Analysis of support types and placement.
•Selection of the most appropriate support type.
•Examples of common support situations and associated calculations.
•Dealing with support friction.
•Worked example problems.

STRESSES AND DISPLACEMENTS AT CONNECTIONS
•Bellows, slip joints, flexible hoses etc.
•Tie rods and limit rods for flexible connections.
•Flange loadings.
•Dealing with piping loads imposed on tanks and vessels.
•Dealing with piping loads imposed on pumps, turbines and compressors.
•Worked example problems.

FABRICATION, INSTALLATION & TESTING
•A brief discussion on selected core material relating to fabrication, installation and testing in AS4041 and ASME B31.3.

COMPUTER BASED SOLUTIONS
•A comparison between the results obtained from various manual calculation methods (e.g. Kellogg, Timoshenko etc) and those obtained from computer programs.
•Discussion relating to popular computer programs for pipe stress analysis.



Pressure Vessel Design to AS1210

Introduction

The design of pressure vessels is a specialist task that requires a thorough understanding of topics such as: "strength of materials"; stress analysis and relevant design codes. Pressure vessel design also necessitates a logical, planned approach to the documentation of all relevant calculations as in many cases, these design calculations can be quite extensive.

AS1210 Pressure Vessels is the governing standard in Australia relating to pressure vessel design. It is therefore appropriate that Australian engineers should be provided with an opportunity to formally receive instruction in the area of pressure vessel design in the context of the relevant Australian standard.

The purpose of this two-day seminar is to provide a thorough understanding of the fundamental design principles of pressure vessels as well as instruction in the most commonly employed clauses of AS1210. Attendees also gain a brief insight into the differences between AS1210 and ASME BPVC Section VIII Div. 1.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, and anyone who needs to design, inspect or sell pressure vessels compliant with AS1210 as part of their job function. This seminar is ideally suited to Junior/Graduate Engineers or those new to the area of pressure vessel design or migrant engineers who have no experience with AS1210.

Delegate Pre-Requisites

As this seminar includes numerous design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

As this seminar guides the attendee from relevant "strength of materials" theory and stress calculations all the way through to AS1210 specific clauses, no previous knowledge or exposure to pressure vessel design is required. However, it would be extremely beneficial for the attendee to have seen some examples of pressure vessels at their place of work prior to attending so that some "context" can be provided to better aid the learning process.

Seminar Objectives

At the completion of this seminar, each attendee should be able to:

- Thoroughly understand how "strength of materials" theory forms the basis of all international pressure vessel codes and standards.
- Understand the most commonly used terms and jargon within the area of pressure vessel design.
- Appreciate the attention to detail required in designing the various components and parts that make-up a pressure vessel (e.g. head types, supports, connections, shells etc).
- Understand how pressure vessels fail.
- Recognise and compare the different methods of stress analysis available for pressure vessel design purposes.
- Design industry standard types of pressure vessels so that compliance with AS1210 is achieved with a minimal amount of supervision and/or guidance from a Senior/Supervising Engineer.
- Appreciate the intent and instruction contained within the most commonly employed clauses of AS1210.
- Understand some basic differences between AS1210 and ASME BPVC Section VIII Div. 1.
- Have a basic understanding of topics relating to: vessel manufacturing methods; vessel testing, marking and qualification; and pressure relief devices.

Training Seminar Materials

All delegates receive:

- **A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.
- **Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Note: KASA is no longer supplying copies of AS1210 for use during the seminar. It is not absolutely necessary to have a copy of AS1210 available during the seminar (but attendees may wish bring their own copies of this standard should they wish to bookmark particular sections for future reference).

Pressure Vessel Design to AS1210

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
•Industry terms and jargon defined.
•Examples of pressure vessel failures.
•Tensile tests and stress-strain diagrams.
•Stresses: Primary , secondary, peak and allowable.
•Failure theories.
•Thin walled versus thick-walled pressure vessels.
•Roark's, Shigley's and Timoshenko's formulas versus finite element (FEA) methods.
•Background information to AS1210.
•Vessel classes.
•AS1210 "Walk-through".
•Worked example problems.

LAYOUT
•Pressure vessel parts and components: Shell, head, legs, skirt, internals etc.
•Pressure Vessel Orientation.
•Examples of industry standard pressure vessels for various selected applications.
•Worked example problems.

AS1210 GUIDANCE - MATERIALS
•Materials selection and specification.
•Commonly used materials and their applications.
•Material identification.
•Materials testing.
•Corrosion allowances.

AS1210 GUIDANCE – LOADS, SHELLS & JOINTS
•Design pressure, temperature, load factors and combined loadings.
•Joint design – welded, brazed, soldered etc.
•Basic shell design – internal pressure only.
•Advanced shell design – pressure and combined loadings.
•Worked example problems.

DAY 2

AS1210 GUIDANCE – LOADS, SHELLS & JOINTS CONTINUED
•Advanced shell design - pressure and combined loadings.
•Advanced shell design – stiffening rings.
•End design – thickness, shape, attachment.
•Design of doors, stays and manholes etc.
•Worked example problems.

AS1210 GUIDANCE – OPENINGS, CONNECTIONS, BRANCHES & SUPPORTS
•Design of openings – un-reinforced and reinforced.
•Design of connections and branches.
•Design of vessel supports.
•Worked example problems.

AS1210 GUIDANCE - ANCILLARIES
•Level gauges.
•Arrestors.
•Relief valves.

AS1210 GUIDANCE – MANUFACTURING
•Pressure vessel fabrication.
•Pressure vessel inspection.
•Testing and documentation.

ASME BPVC Section VIII Div. 1 COMPARISON
•ASME pressure vessel code history and structure.
•A brief summary of design rules and equations.
•A brief comparison between ASME BPVC Section VIII Div. 1 and AS1210.
•A basic worked example problem to ASME BPVC Section VIII Div. 1.



Sewage Pump Station & Rising Main Design

Introduction

The primary focus of this two day course is to provide guidance in the design of the most common types of sewage pump stations and pressure mains. These pump stations include upgrades to traditional dry-well stations, the design of new submersible sewage pump stations or the design of lift stations which utilise self-priming pumps.

Who Should Attend

Engineers and technicians who work in the municipal water/wastewater industry and would like to know how to size, select, troubleshoot, test, install, operate and maintain pumps, piping, dosing systems, electrical equipment and ancillary equipment found in sewage pump stations and pressure mains.

Delegate Pre-Requisites

It is a requirement that each delegate has an understanding of engineering structures and mechanical components. A basic understanding (trade level or higher) engineering maths would also be a necessity. Ideally, each delegate should have a degree or diploma in a relevant technical field or a higher level trade qualification.

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

- Identify the most common sewage pump station types as well as the most common equipment (e.g. pump starters, control panels, dosing systems, odour control units etc) found in sewage pump stations.
- Understand pumps, associated components, hydraulics and terminology.
- Be competent in reading pump performance curves.
- Appreciate the different piping materials and valves available for valve pits and pressure mains.
- Understand the reasons behind standardisation of the design of pump stations and rising mains with due reference to WSAA codes.
- Understand how to correctly determine the static and total dynamic head in a sewage pump system.
- Troubleshoot pump operational problems
- Have a greater understanding of instrumentation used in sewage pumping systems.
- Appreciate the issues related to septicity and odour.

Seminar Objectives Continued

- Identify good and bad wet well geometries and designs.
- Work within the constraints of piping runs and maintenance hole sizes when laying out a new pump station.
- Appreciate the various construction methods available for laying rising mains (e.g. trenching, jacking, directional drilling).
- Identify when a water hammer analysis is required and what the key remedies are for pressure surges.
- Better appreciate issues such as mine subsidence, future population increases and the effect on the asset, negotiating with stakeholders and power supply issues.
- Better appreciate the methods used to maintain pump stations and rising mains and how to design for safer and more efficient emergency maintenance action.

Training Seminar Materials

All delegates receive:

• The **"Sewage Pump Station and Pressure Main Design" Training Manual** – a reference manual comprising theory, worked example problems, tables , charts and illustrations etc based on the seminar outline. This manual has been designed to be a valuable future resource for the office or plant.

• **Certificate of Attendance** – which states the number of hours of training and serves as documentary proof of attendance.

In-House (Customised) Training

This training course can also be delivered as an in-house course. We have delivered courses to various water/wastewater agencies and water/wastewater infrastructure design consultancies around Australia since 2008.

The content of the course can be customised to suit the specific equipment makes/models that you use at your agency or organisation. Additional material can also be included or non-relevant material can be excluded. In this way, this course can be completely customised to suit your needs.

For an in-house presentation of this course, please contact us via phone or email to arrange a detailed proposal.

Sewage Pump Station & Rising Main Design

Seminar Synopsis

DAY 1

INTRODUCTORY INFORMATION
- Terms and definitions
- Codes and standards
- Pump station and pressure main planning
- Traditional dry-well pump stations
- Wet-well (submersible) pump stations
- Lift-type pump stations (PD and centrifugal)

DETERMINING DESIGN HEAD CONDITIONS
- Head losses and friction in pipes, fittings and valves
- WSAA approved methods and traditional methods
- Hydraulic Grade Lines
- Determining hydrostatic test pressures

PRESSURE TRANSIENTS
- Pressure transients (aka "water hammer") theory
- When to conduct a transient analysis
- Mitigation methods

SEWAGE PUMPS
- Traditional end-suction centrifugal pumps
- Wet and dry mounted submersible pumps
- Self-priming centrifugal pumps
- Progressive cavity pumps
- Affinity Laws and Characteristic Curves
- Matching the System to the Pump
- System Curve Calculations
- Troubleshooting
- Installation and Operation

PIPING & PIPELINE SIZING
- The Present Value Method
- The Allowable Velocity Method

PIPES, FITTINGS & VALVES
- Common piping materials for pump stations
- Common pipe materials for pressure mains
- Pipe material selection criteria

DAY 2

PIPES, FITTINGS & VALVES (CONTINUED)
- Common valve types
- A special focus on air valves and air-entrapment
- Pressure ratings and stresses in pipes
- Introduction to AS2566 Buried Flexible Pipelines
- Thrust blocks and trench stops

ELECTRICAL, INSTRUMENTATION & CONTROL
- Pump starters – DOL, VSD and soft starters
- Pump station instrumentation – level and flow
- Pump station control and monitoring systems
- Overview of a typical electrical supply system
- Electrical kiosks and switchrooms
- Lighting requirements
- Emergency power

CONSTRUCTION
- Maintenance holes, emergency storage chambers, valve chambers and wet-wells: pre-cast versus cast-in-situ
- Pipe-laying: trenching, jacking and directional drilling
- Packaged self-priming centrifugal pump stations
- Packaged submersible pump stations
- Packaged progressive cavity pump stations

MISCELLANEOUS TOPICS
- Septicity and odour control – dosing systems and odour control units
- Guidelines for Safety, Operations and Maintenance
- Early stakeholder engagement and approvals
- Designing for mine subsidence effects

COMMON DESIGN ISSUES
- Wet-wells
- Lift stations
- Buried station piping
- Clearances
- Power and communications
- Depths and gradients
- Level settings
- Access for maintenance and emergencies

Piping Design to ASME B31.3

Introduction

The purpose of this two-day course is to provide guidance on the fundamentals of piping stress and flexibility analysis so that compliance with ASME B31.3 is achieved. The secondary aim is to show how to spot check the results from computer based solutions using conservative manual calculation methods.

Upon completion of this course, the attendee should be well placed to perform common pressure piping stress and flexibility analysis tasks under the minimal supervision of a Senior/Supervising Engineer.

Note: This course is identical to KASA's "Piping Design to AS4041 & ASME B31.3" course except all references to AS4041 and other Australian standards have been deleted and international piping sizes and materials specifications (e.g. ASME/ANSI, EN, ISO) have been used.

Who Should Attend

Engineers who are required to design piping systems as part of their job function or those who want to have a better understanding of the requirements of ASME B31.3. This seminar is ideally suited to Junior/Graduate Engineers or those new to the field of piping design and stress analysis.

This course has been specifically designed for presentation in countries other than Australia where the attendees require fundamentals knowledge relating to ASME B31.3 and piping stress analysis.

Delegate Pre-Requisites

As this course includes numerous design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

For the maximum benefit to be obtained, it is recommended that each delegate:

•Is familiar with basic hydraulics theory.

•Has had some previous exposure to piping systems.

Seminar Objectives

The following primary learning objectives have been designed so that each attendee can:

•Understand the difference between "piping hydraulic design", "piping stress analysis" and "piping flexibility analysis".

•Have an appreciation for how "strength of materials" theory forms a basis for all international piping design codes.

•Understand the intent of ASME B31.3 and how the design process should proceed so as to ensure compliance with this piping code.

•Using manual calculation methods, determine the required wall thickness for pipes exposed to load combinations such as internal or external pressure/vacuum, wind, earthquake etc in accordance with the nominated piping codes.

•Using manual calculation methods, design elbows, bends, branches, fabricated tees, headers etc in accordance with the nominated piping codes.

•Using manual calculation methods, determine pipe support spacing and design appropriate supports.

•Understand fatigue analysis, flexibility analysis, fabrication, testing and examination of piping.

•Use appropriate judgment when dealing with stresses at connections with rotating and stationary equipment.

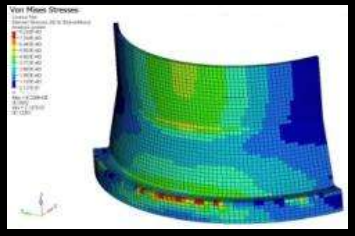
Training Course Materials

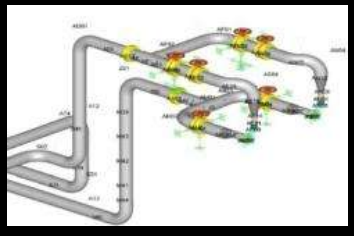
All delegates receive:

•**A Detailed Course Manual** – Which provides a reference text of all of the material presented during the course. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Note: KASA does not supply copies of ASME B31.3 for use during the course.





Piping Design to ASME B31.3

Seminar Synopsis

DAY 1

STRENGTH OF MATERIALS
•Terms and definitions.
•Stress, strain, allowable stresses and safety factors.
•Principle and secondary stresses.
•Axisymetric loading.
•Bending and torsion of pipes.
•Pipes subjected to plane stress.
•Combined bending, torsion and pressure loading.
•Failure theories used in piping design codes.
•Stresses and deflections due to temperature.
•Cyclic loading and creep.
•Examples of piping failure.
•Worked example problems.

ASME B31.3 BACKGROUND
•The history and intent of ASME B31.3.
•The basis of ASME B31.3.
•How to use piping codes.
•A "walk-through" of ASME B31.3.
•Assessment and classification of piping/service combinations.
•Worked example problems.

ASME B31.3 PIPE STRESS ANALYSIS
•Design temperature, design pressure and design loading combinations for stress analysis purposes.
•Basis for determining allowable stresses.
•Reduction factors, allowable stress tables.
•Determining wall thickness for internal pressure.
•Determining wall thickness for external pressure.
•Design of stiffener rings for external pressure or vacuum conditions.
•Design of elbows, bends, branches, fabricated tees, headers etc.
•Determining pipe support spacing.
•Dealing with combined static loadings.
•Dealing with dynamic fluid loadings.
•Worked example problems.

DAY 2

ASME B31.3 PIPE FLEXIBILITY ANALYSIS
•Forces, stresses and displacements due to thermal expansion.
•Methods of providing piping flexibility.
•Stress Intensification and Flexibility Factors (SIFs), elastic equivalent stress, allowable thermal expansion range.
•Cold spring.
•Pressure and its effects on piping flexibility.
•Guidelines on when to perform a piping flexibility analysis.
•The balance between flexibility and structural stability.
•Worked example problems.

PIPE SUPPORTS
•Analysis of support types and placement.
•Selection of the most appropriate support type.
•Examples of common support situations and associated calculations.
•Dealing with support friction.
•Worked example problems.

STRESSES AND DISPLACEMENTS AT CONNECTIONS
•Bellows, slip joints, flexible hoses etc.
•Tie rods and limit rods for flexible connections.
•Flange loadings.
•Dealing with piping loads imposed on tanks and vessels.
•Dealing with piping loads imposed on pumps, turbines and compressors.
•Worked example problems.

FABRICATION, INSTALLATION & TESTING
•A brief discussion on selected core material relating to fabrication, installation and testing in ASME B31.3.

COMPUTER BASED SOLUTIONS
•A comparison between the results obtained from various manual calculation methods (e.g. Kellogg, Timoshenko etc) and those obtained from computer programs.
•Discussion relating to popular computer programs for pipe stress analysis.



Water/Wastewater Pumping/Piping Fundamentals

Introduction

This two day course is a distillation of material from our "Pump Fundamentals" and "Liquid Piping Systems Fundamentals" training courses that is relevant to those who work in the water industry and are required to know about pumping and piping equipment found in treatment plants and pump stations.

Who Should Attend

Engineers and technicians who work in the water industry and would like to know how to size, select, troubleshoot, test, install, operate and maintain pumps, piping and ancillary equipment found in treatment plants and pump stations.

Delegate Pre-Requisites

It is a requirement that each delegate has an understanding of mechanical components. A basic understanding (trade level or higher) engineering maths would also be a necessity. Ideally, each delegate should have a degree or diploma in a relevant technical field or a higher level mechanical trade qualification.

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

- Identify common pump types and their components
- Understand pump, associated component, hydraulics and terminology
- Select the most appropriate pump type, make and model for an application
- Be competent in reading and using pump performance curves
- Understand cavitation and how to prevent it from occurring
- Specify the correct installation configuration for a particular pump type
- Install, commission, operate and maintain common pump types
- Troubleshoot pump problems
- Select the most appropriate pipe material, type and end connection for a particular application
- Determine the correct pipe wall thickness for an application
- Select the most appropriate valve type for an application.
- Be aware of pipe pigging
- Understand the operating principles of typical piping instrumentation relating to flow and pressure

Training Seminar Materials

All delegates receive:

• The **"The Water/Wastewater Pumping & Piping" Training Manual** – a reference manual comprising theory, worked example problems, tables , charts and illustrations etc based on the seminar outline. This manual has been designed to be a valuable future resource for the office or plant.

• **Certificate of Attendance** – which states the number of hours of training and serves as documentary proof of attendance.

In-House (Customised) Training

This training course is only delivered as an in-house course. We have delivered this course to various water agencies and design consultancies around Australia since 2008.

The content of the course can be customised to suit the specific equipment makes/models that you use at your facilities. Additional material can also be included or non-relevant material can be excluded. In this way, this course can be completely customised to suit your needs.

As this is an in-house course, please contact us via phone or email to arrange a detailed proposal.

Three-Day Version of this Course

Please be aware that some water authorities as well as design consultancies who operate in the urban and rural water sector of industry prefer to book us for a three day version of this course. The third day allows for the following additional topics to be presented:

- Sewage pumping stations
- Rising mains
- Water pumping stations
- Positive displacement pumps – Rotary types
- Positive displacement pumps – Reciprocating types

Water/Wastewater Pumping/Piping Fundamentals

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
- Terms and Definitions
- Fluid Properties (Viscosity, Density, Temperature etc)
- Pressure-Head Relationships
- Cavitation
- Basic Hydraulics Theory and Calculations
- Friction Losses in Pipes and Fittings
- Water Hammer
- Air Entrapment
- Worked Example Problems

CENTRIFUGAL PUMPS
- Components, Types and Examples
- Affinity Laws and Characteristic Curves
- Matching the System to the Pump
- System Curve Calculations
- Parallel and Series Pumping Circuits
- Troubleshooting
- Installation and Operation
- Worked Example Problems

PIPE SIZING
- The Present Value Method
- The Allowable Velocity Method
- The Head Loss Available Method

SELECTING PIPE AND FITTINGS
- PVC-U
- PVC-M
- PVC-O
- Polyethylene
- ABS
- Ductile Iron (Cement Lined)
- GRP
- Steel
- Concrete

DAY 2

SELECTING PIPE AND FITTINGS (CONTINUED)
- End Connections, Joints and Fittings
- Calculating Safe Working Pressures
- Determining Stresses in Pipes

VALVES
- A detailed Analysis of Common Valve Types
- Materials of Construction
- Valve Actuators
- Valve Selection & Sizing Guidelines
- Control Valve Selection and Sizing
- Valve Maintenance and Troubleshooting
- Worked Example Problems

INSTRUMENTS
- Typical Instruments for Flow and Pressure
- Selection Guidelines

MISCELLANEOUS TOPICS
- Guidelines for Economic Spool Design
- Guidelines for Safety, Operations and Maintenance
- An Introduction to Piping Design Loads
- Pipeline Pigging

PUMP STATION ISSUES
- Typical Submersible Pump Stations
- Variable Speed Drives – Operational Issues
- Common Design Problems
- Recommended Design Details
- Wet-Well Versus Dry-Well Comparison

Open Pit Dewatering – Pump & Piping Fundamentals

Introduction

Open pit dewatering typically encompasses a combination of diesel and/or electric driven pump-sets located “in-pit”, and, in some cases, located in groundwater bores either “in-pit” or “ex-pit”. Many kilometres of pipelines are also employed to convey the raw water pumped from the pits to the bores to dedicated dams where centrifugal pump-sets are employed to transfer the contained water to process plants, water treatment plants, beneficial use systems or to creek/river discharge points.

The purpose of this two day course is to provide knowledge relating to the sizing, selection, operation, troubleshooting and maintenance of pit dewatering systems which are described by the above-mentioned elements.

Who Should Attend

Dewatering team members, site maintenance personnel, engineers, technicians, operators and hydrogeologists involved in the design, upgrade, operation, installation, testing and maintenance of pit dewatering systems, managed aquifer recharge systems and below water table mining operations.

Delegate Pre-Requisites

There are no academic pre-requisites. This course has been designed to take people with a minimal level of knowledge of pumping equipment and pipelines and teach them pump/piping basics as well as tips and traps relating to operation and troubleshooting.

Ideally, attendees should have had some previous exposure to a working mine or, depending upon the attendee’s job function, some exposure to pumps and pipes. However, we have previously run this course for hydrogeologists with minimal previous pump and piping knowledge and had excellent feedback on the learning outcomes and how the knowledge gained has helped to improve existing dewatering operations.

In-House (Customised) Training

This training course is only delivered as an in-house course. We have presented this course at mine sites and mining company head offices since 2011.

As this is an in-house course, please contact us via phone or email to arrange a detailed proposal.

Seminar Objectives

This course places a great emphasis on the ongoing operation, maintenance and improvement of existing dewatering systems. Case studies are used to highlight issues at existing sites around Australia and the methods used to fix such issues.

At the completion of this seminar, each delegate should be able to:

•Read pump curves for sizing, selection and troubleshooting purposes.

•Gain familiarity with the common types of pumps used on open-pit mine sites and managed aquifer recharge systems such as: submersible pumps (located in sumps), borehole pumps (located in bores) and end-suction centrifugal pumps (for general water transfer on site).

•Appreciate the advantages and disadvantages of different “headworks” designs for borehole pumps used for lowering the water table.

•Understand that dewatering and transfer pumps only have a safe working range and that continued operation outside this range will lead to ongoing pump failures and maintenance cost increases.

•Perform basic calculations relating to pressure, head, pump duty point, motor power, engine power, diesel fuel consumption and power costs.

•Understand the limitations and benefits of the most common types of pipe materials, end connections, valves and fittings used for dewatering systems and water transfer systems on mine sites.

•Be better placed to troubleshoot pumping and piping problems on site as well as look at ways of improving an existing site’s operation and reliability.

Training Seminar Materials

All delegates receive:

•**A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Open Pit Dewatering – Pump & Piping Fundamentals

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
•Fluid properties
•Pressure and head
•Hydraulic Grade Lines, velocity and flowrate
•Static Head, Total Dynamic Head and Friction Head
•Cavitation
•Head losses in pipe, fittings and valves
•Basic pipe sizing checks and calculations

CENTRIFUGAL PUMPS
•Principle of operation
•Classifications and components
•The different types of centrifugal pumps
•Impellers, Affinity Laws and Characteristic Curves
•How to read pump curves
•Pumps in parallel
•Pumps In series
•Testing, priming, starting and stopping
•Troubleshooting centrifugal pumps
•Motor sizing and tips/traps
•Diesel engine sizing and tips/traps

CASE STUDY – IN-PIT DEWATERING
• A detailed look at an existing in-pit dewatering system comprising diesel-driven pump-sets and slurry-grade submersible sump pumps for pit in-flows of 1500 litres per second.

CENTRIFUGAL SLURRY PUMPS & PIPELINES
•Components, types, examples, design features.
•Selecting materials of construction based on wear classes and service classes.
•Envelopes of operation.
•Focus on submersible slurry pumps
•Focus on horizontal end-suction slurry pumps.
•Maintenance considerations
•Pipelines for low-solids concentration settling slurries
•Troubleshooting of pipelines

DAY 2

SELF-PRIMING PUMPS
•Dry prime and wet prime
•Maintenance considerations
•Troubleshooting
•Advantages and disadvantages of self-priming pumps

CASE STUDY – GROUND WATER LOWERING
•A detailed look at an existing “ex-pit” dewatering system for the lowering of ground water levels for below water table mining for a peak total combined capacity of 120 megalitres per day. This case study focuses on borehole pumps, their design, operation, maintenance, use of shrouds and headworks designs employed.

MOTOR STARTERS & PUMP INSTALLATION TIPS
•Electric motor basics
•DOL starting, soft starters and variable speed drives
•Pump installation tips
•Suction and discharge piping tips

SEALS & PACKING
•Gland packing
•Dynamic (centrifugal) seals
•Basic mechanical seals and seal setups found in dewatering, submersible and transfer pumps.

CASE STUDY – TRANSFER PIPELINE
•A detailed look at the upgrade of a water transfer pipeline at an existing site and the constraints faced in increasing its capacity.

MISCELLANEOUS PIPING TOPICS
•Pressure ratings
•Water hammer
•Typical valves used in dewatering systems
•Polyethylene piping and pipelines
•Steel piping and pipelines
•Flanges and flange ratings
•Basic pressure piping calculations and checks
•Hydrostatic testing



Slurry Pumping & Piping Fundamentals

Introduction

This three day course is an amalgamation of the slurry-related material found in our "Pump Fundamentals" and "Liquid Piping Systems Fundamentals" courses combined with the fundamentals-level material found in our "Advanced Slurry Pumping & Piping" course.

Who Should Attend

Consulting Engineers, Process Engineers, Design Engineers, Project Engineers, Slurry Pump & Piping Sales Representatives and anyone who needs to select, specify, commission, install and/or troubleshoot slurry pumping equipment and slurry piping.

It is a requirement that each delegate has an understanding of mechanical components. Experience with diploma or degree level engineering maths would also be advantageous.

Delegate Pre-Requisites

For the maximum benefit to be obtained, it is recommended that each delegate:

•Has an understanding of mechanical components.

•Has had some previous exposure to slurry systems.

•Is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or mining engineering).

In-House (Customised) Training

This training course is only delivered as an in-house course.

The content of the course can be customised to suit the specific equipment makes/models that you use at your facilities. Additional material can also be included or non-relevant material can be excluded. In this way, this course can be completely customised to suit your needs.

As this is an in-house course, please contact us via phone or email to arrange a detailed proposal.

Seminar Objectives

At the completion of this seminar, each delegate should be able to:

•Have a greater understanding of hydraulics theory such as pressure-head relationships, cavitation, NPSH, hydraulic grade lines, motor and engine power, and pipe head loss calculations.

•Read and understand pump curves for all pump types.

•Understand how to determine the required pipe wall thickness and flange rating for a given application.

•Understand how the relevant slurry properties are determined in a laboratory environment.

•Understand the principles of determining head loss in both settling and non-settling slurries.

•Be aware of the effects of particle size and solids concentration with respect to de-rating of pump performance for a particular slurry.

•Appreciate the advantages and disadvantages of the more commonly used slurry piping materials so that material selection can be carried out in a more informed manner.

•Be aware of the more common piping operational issues.

•Determine whether a centrifugal slurry pump or a positive displacement pump is a better choice for a particular application.

•Have a greater understanding of the more commonly available centrifugal and positive displacement pumps used for slurries.

•Be aware of various slurry pump operational issues, recommended piping configurations and component choices.

Training Seminar Materials

All delegates receive:

•**A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Slurry Pumping & Piping Fundamentals

Seminar Synopsis

DAY 1

BACKGROUND INFORMATION
•Specific Gravity, solids concentration, particle size analysis, rheograms (aka "flow curves"), viscosity.
•Newtonian and Non-Newtonian slurries
•Non-Newtonian Flow Models
•Homogeneous, heterogeneous, stratified and sliding bed flow profiles.
•Classifications – Settling and Non-Settling slurries.
•Slurry Pump Performance Basics.
•Worked Example Problems.

CENTRIFUGAL SLURRY PUMPS
•Components, types, examples, design features.
•Selecting materials of construction based on wear classes and service classes.
•Envelopes of operation.
•Series and parallel pumping, design & operational Issues.
•A review of the commonly available types of seals and packing.
•Focus on submersible slurry pumps
•Focus on horizontal end-suction slurry pumps.
•Drive Arrangements.
•Maintenance considerations.
•Gland water setups.
•Worked example problems

DAY 2

THE DE-RATING OF SLURRY PUMPS
•Recommended methods of determining the de-rating effects (i.e. Head Ratio, Efficiency Ratio etc) on centrifugal slurry pumps when dealing with settling slurries.
•Dealing with non-settling, non-Newtonian slurries.
•Dealing with frothing slurries.
•NPSHR corrections.
•Worked example problems.

POSITIVE DISPLACEMENT PUMPS
•A review rotary and reciprocating PD pumps for slurry.
•Selection criteria, relative advantages and disadvantages, envelopes of operation.

DAY 2 CONTINUED

POSITIVE DISPLACEMENT PUMPS (CONTINUED)
•Operation and maintenance considerations.
•Recommended suction and discharge piping arrangements.

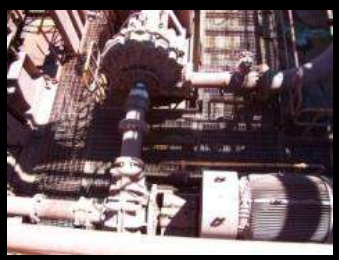
A FOCUS ON FROTH PUMPING
•Froth pumps
•Centrifugal slurry pumps for froth
•Recommended suction and discharge piping
•Calculations and worked examples for froth pumping

DAY 3

SLURRY PIPING – MATERIALS, EXAMPLES & ISSUES
•A review of common slurry piping materials of construction including: rubber lined steel, ceramic lined steel, plastic lined steel, polyethylene, fibreglass etc.
•Selection criteria, advantages/disadvantages etc of the above-mentioned materials.
•Pipe wear and wear testing methods.
•Valves and instruments for slurries.

PIPING DESIGN FOR NON-SETTLING SLURRIES
•Recommended methods for determining head loss for laminar and turbulent flow from viscosity measurements and/or small-scale pipe flow data.
•Recommended method for determining head loss for Newtonian Non-Settling Slurries.
•Worked example problems.

PIPING DESIGN FOR SETTLING SLURRIES
•Recommended methods for determining head loss.
•Recommended methods for determining the Deposit Velocity.
•Recommendations for pipe diameter and flow velocity.
•Flow in inclined pipes.
•Worked example problems.



Pressure Vessels Essential Knowledge

Introduction

The intent of this course is to provide knowledge to site-based engineers (e.g. Plant Engineers, Maintenance Engineers and Operations Engineers) which is essential for ensuring that pressure vessels and pressure piping systems are safe to operate and maintain (i) on an ongoing basis, or (ii) after modification to the equipment/system itself or the process it is located in.

Upon completion of this course, the attendee should be well placed to liaise with vessel/piping system designers, perform some design work themselves or to determine fundamental "fitness-for-service" and remaining life assessments.

Who Should Attend

Engineers (i) who are required to ensure the safe ongoing operation of pressure vessels and pressure piping, or (ii) are required to design pressure vessels or piping systems to *ASME B31.3, AS 4041* or *AS 1210* as appropriate, or (iii) who have to perform process safety, plant maintenance/reliability engineering or "fitness-for-service" roles. This course is ideally suited to Junior/Graduate Engineers or those new to the field of piping and pressure vessels who have roles in end-user organisations rather than in design consultancies.

Delegate Pre-Requisites

As this course includes numerous calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

For the maximum benefit to be obtained, it is recommended that each attendee:

- Is familiar with basic hydraulics theory.
- Has had some previous exposure to pressure vessels and piping systems.

Those who have previously attended KASA's "*Liquid Piping Systems Fundamentals*" course should also be well placed to derive maximum benefit from this course.

Overlap With Other KASA Courses

This course is an alternative to completing both of KASA's *Piping Design to AS 4041 & ASME B31.3* and *Pressure Vessel Design to AS 1210* courses (which are primarily for designers rather than end-users).

Course Objectives

The following primary learning objectives have been designed so that each attendee can:

•Determine the pressure vessel registration, inspection and testing requirements that apply in their state/territory upon initial vessel purchase as well as for ongoing operation.

•Determine the hazard level in accordance with *AS 4343* for both pressure piping and pressure vessels so that appropriate design, fabrication and testing methods are applied throughout the asset lifecycle.

•Understand the intent of *AS4041, ASME B31.3* and *AS 1210* and how the design process should proceed so as to ensure compliance with these codes.

•Design (or modify) simple pressure piping installations for compliance with either *AS 4041* or *ASME B31.3*.

•Perform "remaining life" calculations for pressure vessels and pressure piping using the thickness equations located in *AS 1210, AS 4041* or *ASME B31.3* as appropriate.

•Understand piping and pressure vessel failure modes and what inspection and testing methods are appropriate to obtain early warning of impending failure.

•Understand what safety and relief devices are required for pressure vessels and pressure piping and what testing and inspection requirements apply for ongoing operation.

•Appreciate the key in-service inspection requirements detailed in *AS/NZS 3788* and how to comply with these requirements.

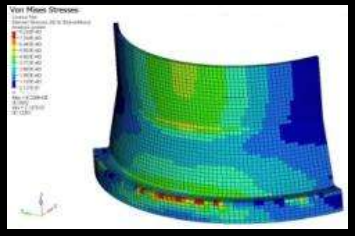
Training Course Materials

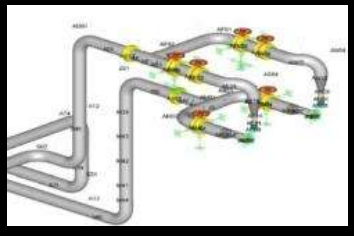
All delegates receive:

•**A Detailed Course Manual** – Which provides a reference text of all of the material presented during the course. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Note: KASA does not supply copies of any standard or code. It is not absolutely necessary to have a copy during the course but attendees may wish to bring their own copies of these standards/codes for easy referencing.





and Pressure Piping – for End Users

Course Synopsis

DAY 1

BACKGROUND INFORMATION
- Terms and definitions.
- Stress, strain, allowable stresses and safety factors.
- Principle and secondary stresses.
- Combined bending, torsion and pressure loading.
- Failure theories used in design codes.
- Stresses and deflections due to temperature.
- Cyclic loading and creep.
- Loss of ductility – low temperatures
- Australian (and US) pressure equipment standards
- Hazard levels – *AS 4343*
- Worked example problems.

PRESSURE VESSELS – OWNER OBLIGATIONS
- Theory – pressure, stresses and stored energy
- Design Pressure, MAWP and relief settings
- Bursting discs, safety valves and relief valves
- The law, vessel registration and regulatory requirements
- Inspection and testing – *AS/NZS 3788* overview
- Failure modes and vessel safety

DAY 2

PRESSURE PIPING – *AS 4041* VERSUS *ASME B31.3*
- A "walk through" of *AS 4041 Pressure Piping*
- A "walk through" of *ASME B31.3 Process Piping*

PRESSURE DESIGN AND COMBINED LOADS
- Design temperature, design pressure
- Allowable movements
- Pipe – internal and external pressure
- Design of fittings
- Pipe and vessels – branch connections
- Pipe – Longitudinal stresses
- Pipe – Support spacings

PRESSURE PIPING – THERMAL CYCLING
- Self-limiting and elastic stress
- Allowable stress range for thermal expansion
- Flexibility analysis and flexibility stresses

DAY 3

FABRICATION, INSTALLATION AND TESTING
- Hydrostatic, pneumatic and in-service leak testing
- Non-destructive test methods
- Pipe testing requirements
- Pressure vessel testing requirements

INSPECTION BODIES AND PERSONNEL
- The "competent person"
- Welder and welding inspector qualifications

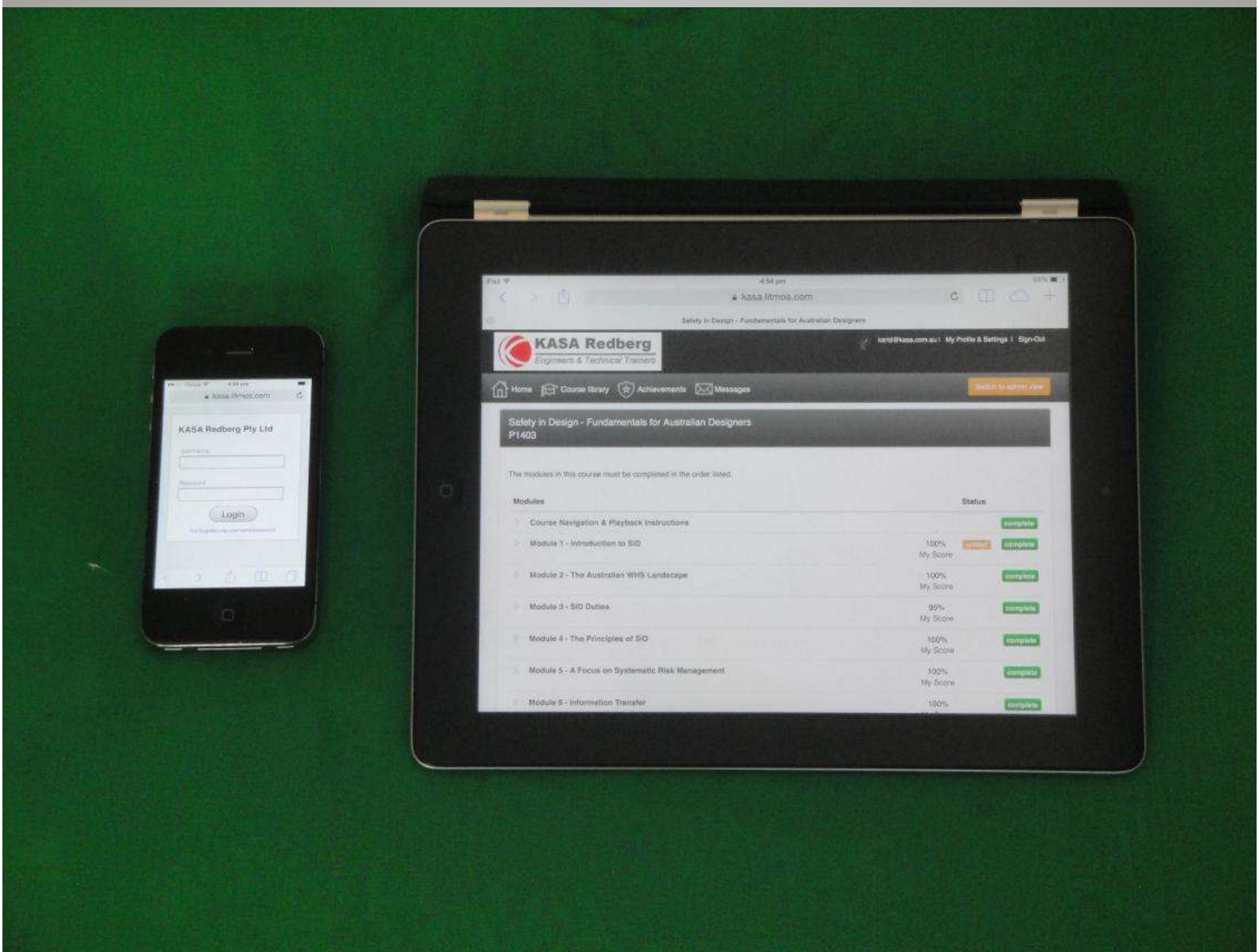
IN-SERVICE INSPECTION
- Standards and codes: *AS/NZS 3788, API 510, API 570, API 572, API 574*
- *AS/NZS 3788* – detailed inspection requirements
- Risk-based inspection

FITNESS FOR SERVICE
- Defects and potential repair methods
- Wall thickness calculations
- Remaining life assessment
- De-rating and re-rating

SUMMARY AND WRAP-UP
- Summary of key points
- Open discussion – question and answer session



Online (e-Learning) Courses



Safety in Design Fundamentals for Australian Designers

Introduction

In recent years there has been a concerted effort across the states and territories of Australia to "harmonise" the work health and safety obligations of persons conducting a business or undertaking (PCBUs) as well as those, such as designers, who work for, or provide services to PCBUs.

These obligations revolve around the need for designers to produce designs that lead to safe workplaces (i.e. safe buildings, structures, plant and equipment).

The purpose of this three hour online (e-learning) course is to provide basic instruction and guidance on the WHS obligations of designers in Australia as well as provide recommendations on how best to fulfil these obligations thereby providing safer designs.

Who Should Access the Course

Design Engineers, Project Engineers, Consulting Engineers; Line Managers and Supervisors; Design & Construct Professionals, or anyone who needs to understand the WHS obligations relating to the design of buildings, structures, plant and equipment.

Delegate Pre-Requisites

No previous knowledge or qualifications are required.

Course Objectives

At the completion of this course, each delegate should be able to:

- Understand the state of harmonisation relating to WHS legislation in Australia.
- Define key WHS terms.
- Know where to obtain WHS related information in the public domain as well as know the role of each WHS authority.
- Better understand the seven principles of safety in design.
- Be aware and have a basic appreciation of systematic risk management as well as hazard identification and analysis tools such as: HAZID, HAZOP, CHAIR, Fault Tree Analysis, Event Tree Analysis, Risk Registers and Risk Assessment Matrices.
- Have a better understanding of safety-related information transfer and the specific inclusions required in design safety reports and construction safety reports.

Training Course Materials

All users receive:

- The **"Safety in Design – Fundamentals for Australian Designers" Training Manual** – a reference manual in PDF format comprising terms and definitions, theory, guidance and instructions etc based on the course outline. This manual has been designed to be a valuable future resource for the office.

- **Certificate of Attendance** – which states the number of CPD* hours of training and serves as documentary proof of completion.

CPD hours = Continuing Professional Development hours allocated in accordance with Engineers Australia policy.

Learning Management System & User Access

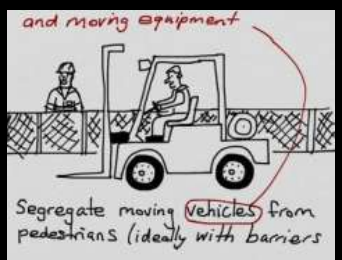
This course and the training course materials are accessed through the KASA Redberg learning management system (LMS) which is hosted by Litmos.

Login details are provided to registrants via the KASA Redberg website once payment has been made via credit card or a PayPal account. Once the funds have been received, an auto-generated email with login details and a receipt of payment will be sent to the registrant. This usually only takes a few minutes. The registrant can then access the course immediately by following the links in the email or by returning to the appropriate page on the KASA Redberg website.

Access via Your Company's Intranet or LMS

Should your company have multiple users who want to access one or more of our online courses, it may be more cost effective to pay a fee for access where we can assign courses in bulk to your staff. Alternatively, an annual fee can be paid for the course files to be provided to your IT Department for incorporation into your own company's intranet or learning management system. Please contact KASA Redberg on (02) 5105 4082 or info@kasa.com.au to find out more.

It should also be noted that all of our online courses are easily viewed on a PC, Mac, iPhone, iPad or any Android phone/tablet device.



Safety in Design Fundamentals for Australian Designers

Course Synopsis

MODULE 1 – INTRODUCTION & BACKGROUND
- Common Terms and Definitions
- What is SiD and Why is it Important?
- Designer
- Building or Structure
- Plant
- Workplace
- Person Conducting a Business of Undertaking (PCBU)
- Lifecycle

MODULE 2 - THE WHS LANDSCAPE IN AUSTRALIA
- The Australian WHS Landscape
- Acts, Regulations and COPs

MODULE 3 - DUTIES
- The Duties of a Designer
- The Duties of the Client
- Getting it Wrong
- What is Reasonably Practicable?

MODULE 4 – THE PRINCIPLES OF SiD
- Principle 1 – Persons With Control
- Principle 2 – Consider the Whole Lifecycle
- Principle 3 – Systematic Risk Management
- Principle 4 – Safe Design Knowledge and Capability
- Principle 5 – Information Transfer
- Principle 6 – Consultative Process
- Principle 7 – Ergonomics

MODULE 5 – A FOCUS ON SYSTEMATIC RISK MANAGEMENT
- Step 1 – Hazard Identification
- Step 2 – Risk Assessment
- Step 3 – Risk Control Process

MODULE 6 – A FOCUS ON INFORMATION TRANSFER
- The Safe Design Report
- The Risk Register
- The Safe Design WHS File
- The Construction Safety Report
- The Plant Hazard Report
- The Use of Drawings and Other Documents

MODULE 7 – TIPS FOR SAFE DESIGN
- Video of safe design tips

Wind Loading to AS/NZS 1170.2

Introduction

The AS/NZS 1170 suite of standards provides requirements for designing buildings and structures so that they can withstand normal, everyday loading conditions as well as spurious conditions such as cyclones, earthquakes and snow loads.

The purpose of this three hour online (e-learning) course is to provide basic instruction and guidance for designers in Australia and New Zealand with regards to the design of buildings and structures so that they can withstand wind forces.

Who Should Access the Course

Design Engineers, Project Engineers, Consulting Engineers; Design & Construct Professionals, or anyone who needs to understand how to interpret the requirements of the Australian and New Zealand standard related to wind loading.

Delegate Pre-Requisites

No previous knowledge or qualifications are required.

Course Objectives

At the completion of this course, each delegate should be able to:

- Understand wind pressure and the effects on individual structural elements as well as complete buildings.
- Appreciate how to obtain wind speed data.
- Use basic wind speed data to derive design wind pressures.
- Appreciate the effects of openings on buildings and how they affect the wind forces at play.
- Be aware of the underlying theory and background relating to pressure differentials, wind speed and wind forces.
- Perform calculations to determine the wind pressures and wind forces on buildings and structures such as: rectangular buildings, free-standing roofs and chimneys/stacks.
- Be able to identify a wind-sensitive structure and when the dynamic response factor should be employed.
- Interpret terrain, topography and shielding data and the effect of this data on the design wind pressure.

Training Course Materials

All users receive a **Certificate of Attendance** which states the number of CPD* hours of training and serves as documentary proof of completion. This certificate is made available for download immediately upon successful course completion.

CPD hours = Continuing Professional Development hours allocated in accordance with Engineers Australia policy.

Learning Management System & User Access

This course is accessed through the KASA Redberg learning management system (LMS) which is hosted by Litmos.

Login details are provided to registrants via the KASA Redberg website once payment has been made via credit card or a PayPal account. Once the funds have been received, an auto-generated email with login details and a receipt of payment will be sent to the registrant. This usually only takes a few minutes. The registrant can then access the course immediately by following the links in the email or by returning to the appropriate page on the KASA Redberg website.

Access via Your Company's Intranet or LMS

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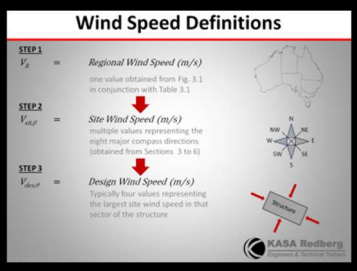
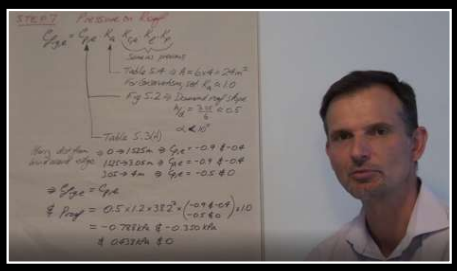
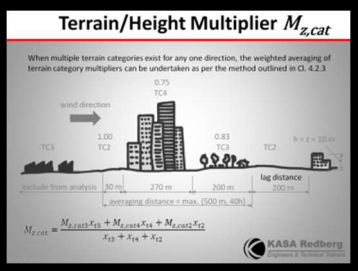






Wind Loading to AS/NZS 1170.2

Course Synopsis

MODULE 1 – INTRODUCTION & BACKGROUND
- Brief History and Background
- Wind Forces
- Derivation of Design Wind Pressure
- The Scope of AS/NZS 1170.2
- Exclusions

MODULE 2 - SPEED
- Wind Speed Definitions
- Regional Wind Speed
- Site Wind Speed
- Wind Direction Multiplier
- Terrain/Height Multiplier
- Shielding Multiplier
- Assessing Terrain & Shielding
- Topographic Multiplier

MODULE 3 – DESIGN WIND PRESSURE
- Design Wind Pressures
- The Aerodynamic Shape Factor
- Openings
- Determining Cfig

MODULE 4 – VIDEO TUTORIAL
- Worked Example Problem – Freestanding Wall

MODULE 5 – VIDEO TUTORIAL
- Worked Example Problem – Rectangular Building

MODULE 6 – DOMINANT OPENINGS
- Wind Tunnel Simulation – Dominant Openings

MODULE 7 – FREE ROOFS
- Wind Tunnel Simulation – Free Roofs

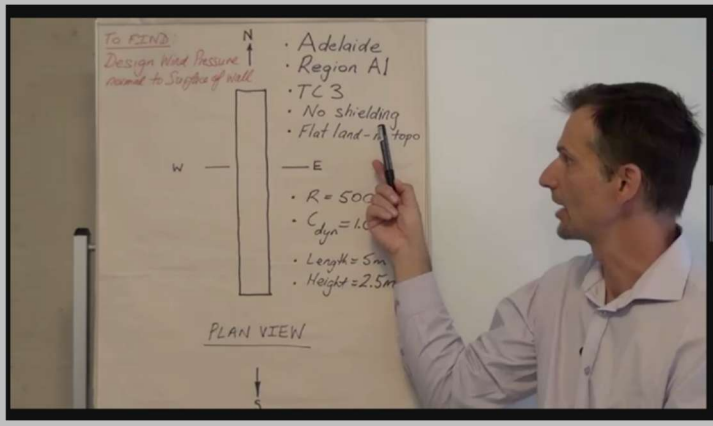
MODULE 8 – DYNAMIC RESPONSE FACTOR
- Introduction to the Dynamic Response Factor
- Wind Sensitive Structures
- Rigidity and Serviceability
- Factors Affecting Natural Frequency
- Determining the Natural Frequency
- Calculating the Dynamic Response Factor

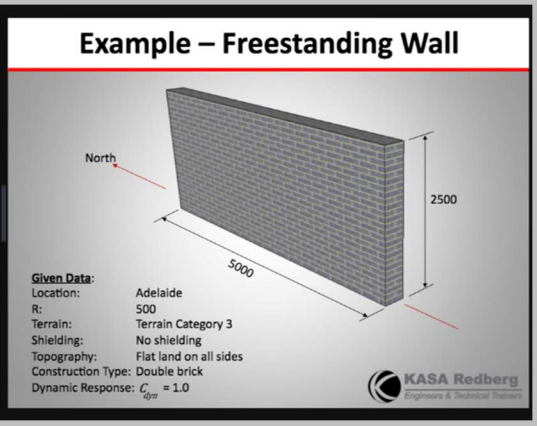
MODULE 9 – THETA AND WIND DIRECTION
- Theta and Wind Direction

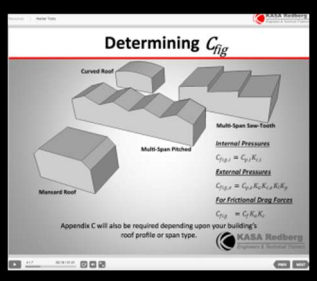
MODULE 10 – FORCES
- AS/NZS 1170.2 Section 2.5
- Force Resultants

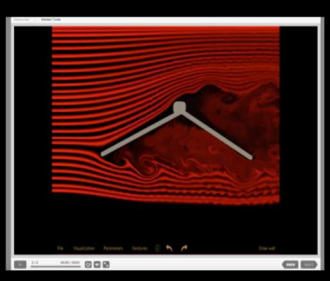
MODULE 11 – VIDEO TUTORIAL
- Worked Example Problem – Sewer Vent Stack

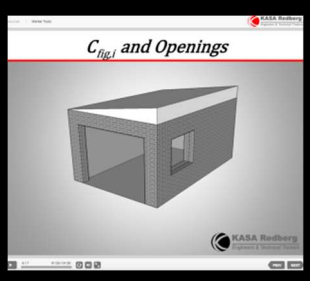
MODULE 12 – QUIZ
- End of Course Quiz











Supplementary Information

Presenter Profiles

Karl Danenbergsons
BE (Mech Hons 1), MBA (Tech Mngt), FIEAust, CPEng, RPEQ

Karl Danenbergsons is one of the founding Directors of KASA. He has been well known to KASA seminar attendees since January 2004 and he has successfully presented various seminars in public and private venues since that time.

Karl's experience with pump and piping systems spans more than twenty five years. He has applied his knowledge of fluid storage, pumping and piping systems for major organisations such as ADI, BHP, James Hardie, Nalco and URS. He has held various positions in these organisations such as Design Engineer, Project Engineer, Process Engineer and Senior Project Engineer amongst others. Karl held the position of Engineering Division Manager for Nalco (1999–2005) and his group was responsible for the design, supply, installation and commissioning of chemicals handling and water treatment plants with a geographical coverage spanning China, Japan, Thailand, Korea, Malaysia, Singapore, New Zealand and Australia. He also held the position of Director – NSW Process, Mechanical & Electrical for URS (2011–2014). His group was responsible for the design of municipal pumping stations, mine water supply systems, mine dewatering systems, managed aquifer recharge systems as well as in-plant piping, process and electrical design work.

Karl has lived and worked in the US whilst operating as a Design/Process Engineer specialising in slurry-based processes. He has also completed on-site commissioning and troubleshooting of chemicals and water treatment plants in countries such as Fiji, New Caledonia, USA, Italy, China and the UK. A transfer to KASA Redberg (UK) in 2007/08 resulted in specialist consulting activities in the areas of red mud disposal as well as sand/gravel operations.

Courses Presented: *Advanced Slurry Pumping & Piping*
Liquid Piping Systems Fundamentals
Pump Fundamentals
Piping Design to AS4041 & ASME B31.3
Open Pit Dewatering Pumping/Piping

John Westover
BSChE, M Eng Sci, CEng, FIChemE, AAIChE

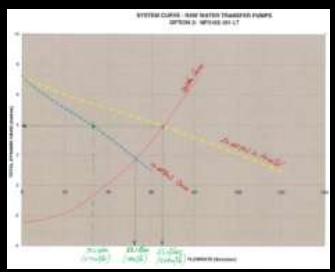
John has over 35 years of experience in the oil and gas industry, and his career has taken him from the US Rocky Mountains and the Arctic Coast of Alaska to various locations in Australia, with several stops in between. He has previously worked for both owner/operators such as Amoco and BP as well as the engineering company - Fluor and has first hand understanding of the unique needs and requirements of various stakeholders.

He first earned the respect of his operations and maintenance co-workers when he proved some thermocouples were not working properly - he had to wear a safety harness and climb a 35-tray distillation column outside the ladder cage to get some data (the data verified his theory).

After reaching the age of 40, John completed his Masters degree, specifically looking at how process integration could be systematically used to reduce the weight of offshore platforms (which resulted in a paper for the Society of Petroleum Engineers). Since then his career has started to transition into training and mentoring roles. He developed a practical course for Monash University, showing how the principles of Chemical Engineering taught in school could be applied to real engineering problems and has consistently been one of the most highly rated courses by the students.

John has been presenting KASA seminars since 2010.

Courses Presented: *Gas Piping Systems Fundamentals*
Liquid Piping Systems Fundamentals
Pump Fundamentals
Water/Wastewater Pumping/Piping
Open Pit Dewatering Pumping/Piping



Presenter Profiles

Prof. Paul Slatter

Since 2012, Prof. Slatter has held the position of Australian Principal Engineer for Rheology and Slurry at ATC Williams. Prior to accepting this appointment, he had a long and distinguished academic career, first as a Professor and the Director of the Rheology and Slurry Flow Research Centre in the Department of Civil Engineering at the Cape Peninsula University of Technology, Capetown, South Africa (1980 to 2008) and then RMIT University, Melbourne as a Professor of Rheology and Fluid Engineering and Director of the Rheology and Materials Processing Centre in the School of Civil, Environmental and Chemical Engineering (2009 to 2012).

Prof. Slatter has had a strong connection with industry for over thirty years and has been regularly involved with slurry pipeline and process design and consulting. He regularly presents training courses for various organisations around the world and is actively involved in research programs and conferences relating to rheology and slurry flow.

Given that Prof. Slatter has been so active with industry and academia for so long, has published many referenced papers and has pioneered a new Reynolds Number design approach for yield stress materials, it is no wonder that many regard him as one of the pre-eminent and most influential leaders in the field of slurry handling.

KASA has been fortunate to have Prof. Slatter present selected topics of the Advanced Slurry Pumping & Piping seminar since 2009.

Courses Presented: Advanced Slurry Pumping & Piping (selected topics)

Anthony Wilkinson
BE (Mech Hons), CPEng, RPEQ

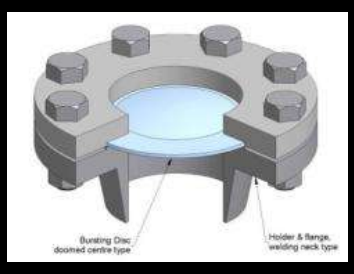
Anthony Wilkinson is a Director of Sherwood Design & Engineering Pty Ltd, a Sydney based engineering consultancy firm which has offered engineering support services to industry since 1969. As well as managerial and business development duties, he works mainly as a mechanical design engineer, and a large proportion of his time involves offering design and design verification services to the pressure vessel industry.

Anthony's experience as a design engineer spans some 20 years, firstly offering services to BHP (now Bluescope Steel), which continues to this day, as well as minerals processing, food processing and pharmaceutical companies. During these earlier years he started learning pressure vessel design to AS1210 based on Sherwood Design & Engineering's experience with fumigation chambers, which started in the mid 70's. Anthony now provides his design services to a broad array of clients including James Hardie Industries and CSIRO.

With regulation changes in the late 90's where WorkSafe authorities nationally put pressure vessel design verification out to private practice, Anthony became a listed verifier with WorkCover New South Wales and implemented a licensed quality management system to ISO9001 to enable the company to offer its verification services Australia wide. He now also has a client base in the US, Japan, China, Korea, France, Germany and Sweden.

Anthony has been presenting for KASA since 2013.

Courses Presented: Pressure Vessel Design to AS1210



Contact Details & Capabilities

About KASA Redberg

KASA Redberg is a technical training and engineering consulting group.

We have core competencies in pumping systems, piping systems, pipelines, pressure vessels and slurry handling systems. We also act as independent HAZOP workshop facilitators and Safety-in-Design workshop facilitators.

Our portfolio of services includes:

•Tank and vessel design.
•Chemicals plant design.
•Water treatment plant design.
•Pumping and piping systems design.
•Pump station and pipeline design
•Mine dewatering and water supply systems design.
•Pipe stress analysis
•Pipeline hydraulic modelling
•Water hammer analysis
•Slurry piping systems design and slurry pump selection.
•On-site troubleshooting of pumps and piping systems.
•Operator training Seminars
•HAZOP workshop facilitation
•Safety-in-Design workshop facilitation

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